

CLAIMS

What is claimed is:

1 A process of manufacturing a plurality of fluid jetting apparatuses at once,

2 comprising:

3 forming a nozzle part by a spinning process; and

4 then adhering a membrane to the nozzle part and a heat driving part to position the heat

5 driving part, the membrane and the nozzle part in order to form the fluid jetting apparatuses in

6 the shape of a wafer.

7 2. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
8 in claim 1, further comprising:

9 forming electrodes and heating elements on a first substrate of wafer;

10 forming driving fluid barriers on the electrodes and the heating elements; and

11 forming driving fluid chambers in the driving fluid barriers, to form the heat driving

12 part.

13 3. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
14 in claim 1, further comprising:

15 forming a polyimide coating layer on a substrate of wafer; and

16 separating the substrate from the polyimide coating layer, to form the membrane.

17 4. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
18 in claim 3, further comprising:

19 coating an adhesive polyimide on the polyimide coating layer after forming the

20 polyimide coating layer on the substrate.

21 5. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
22 in claim 3, wherein the forming of the polyimide layer is performed by a spinning process.

3 6. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
4 in claim 3, further comprising:
5 attaching a reinforcing ring on the polyimide coating layer prior to adhering the
6 membrane to the nozzle part;
7 adhering the membrane to the nozzle part; and
8 separating the reinforcing ring from the polyimide coating layer after adhering the
9 membrane to the nozzle part.

1 7. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 1, wherein the forming of the nozzle part comprises:
3 forming a nozzle plate on a substrate of wafer by the spinning process;
4 forming jetting fluid barriers on the nozzle plate by the spinning process;
5 forming jetting fluid chambers in the jetting fluid barriers;
6 forming nozzles in the nozzle plate; and
7 separating the substrate from the nozzle plate.

1 8. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 7, further comprising:
3 adhering the membrane to the nozzle plate, wherein the separating of the substrate from
4 the nozzle plate is accomplished after adhering the membrane to the nozzle part.

1 9. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 7, further comprising:
3 attaching a reinforcing ring beneath the substrate before forming the nozzle plate on the
4 substrate;
5 adhering the membrane to the nozzle plate; and
6 separating the reinforcing ring and the substrate altogether from the nozzle plate after
7 adhering the membrane to the nozzle plate.

1 10. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 7, wherein the forming of the jetting fluid chambers in the jetting fluid barriers is
3 accomplished by a process of wet etching.

1 11. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 7, wherein the forming of the nozzles in the nozzle plate is accomplished by using a
3 laser beam from a treating apparatus.

1 12. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 7, wherein the forming of the nozzles in the nozzle plate is accomplished by a process
3 of reactive ion etching.

1 13. A process of manufacturing a plurality of fluid jetting apparatuses, comprising:
2 forming electrodes and heat elements on a first substrate of silicon wafer, forming
3 driving fluid barriers on the electrodes and heat elements, and driving fluid chambers in the
4 driving fluid barriers, to form a heat driving part;

5 forming a polyimide coating layer on a second substrate of silicon wafer, forming an
6 adhesive polyimide coating layer on the polyimide coating layer, attaching a first reinforcing
7 ring to the adhesive polyimide coating layer; and separating the polyimide coating layer from
8 the second substrate after attaching the first reinforcing ring on the adhesive polyimide coating
9 layer, to form a membrane;

10 attaching a second reinforcing ring beneath a third substrate of silicon wafer by the
11 spinning process, forming a nozzle plate on an opposite side of the third substrate from that of
12 the second reinforcing ring, forming jetting fluid barriers on the nozzle plate, forming jetting
13 fluid chambers in the jetting fluid barriers, and forming nozzles in the nozzle part;

14 adhering the polyimide coating layer of the membrane to the jetting fluid barriers, and
15 separating the second reinforcing ring and the third substrate of silicon wafer, from the nozzle
16 plate; and

17 adhering the adhesive polyimide coating layer of the membrane to the driving fluid
18 barriers of the heat driving part.

1 14. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 13, wherein the forming of the polyimide coating layer on the second substrate and the
3 forming of the adhesive polyimide coating layer on the polyimide coating layer are
4 accomplished by the spinning process.

1 15. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 13, wherein the forming of the nozzles in the nozzle plate is accomplished by using a
3 laser beam from a treating apparatus.

1 16. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 13, wherein the forming of the nozzles in the nozzle plate is accomplished by a
3 process of reactive ion etching.

1 17. A process of manufacturing a plurality of fluid jetting apparatuses at once,
2 comprising:
3 forming a nozzle part on silicon wafer by a spinning process;
4 adhering the nozzle part with the silicon wafer to a membrane;
5 removing the silicon wafer from the nozzle part; and
6 adhering the membrane to a heat driving part.

1 18. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 17, wherein the adhering of the membrane to the heat driving part is performed by the
3 spinning process.

1 19. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 17, wherein the forming of the nozzle part comprises:

3 forming a nozzle plate on a first substrate by the spinning process;
4 forming jetting fluid barriers on the nozzle plate by the spinning process;
5 forming a first reinforcing element on the first substrate;
6 forming jetting fluid chambers in the jetting fluid barriers; and
7 forming nozzles in the nozzle plate.

1 20. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 17, further comprising:

3 forming the membrane, comprising
4 forming a polyimide coating layer on a substrate of silicon wafer;
5 forming an adhesive polyimide coating layer on the polyimide coating layer;
6 forming a reinforcing element on the adhesive polyimide coating layer; and
7 separating the polyimide coating layer from the substrate after forming the
8 reinforcing element on the adhesive polyimide coating layer.

1 21. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 19, further comprising:

3 forming the membrane, comprising
4 forming a polyimide coating layer on a second substrate of silicon wafer;
5 forming an adhesive polyimide coating layer on the polyimide coating layer;
6 forming a second reinforcing element on the adhesive polyimide coating layer;
7 and
8 separating the polyimide coating layer from the second substrate after forming
9 the second reinforcing element on the adhesive polyimide coating layer.

1 22. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 21, wherein the adhering of the nozzle part to the membrane comprises adhering the
3 polyimide coating layer to the jetting fluid chambers after the separating of the polyimide
4 coating layer from the second substrate.

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1 26. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 25, wherein the adhering of the membrane to the heat driving part is performed after
3 the adhering of the nozzle part to the membrane.

1 27. A process of manufacturing a plurality of fluid jetting apparatuses, comprising:
2 forming a nozzle part on a first substrate of silicon wafer by a spinning process;
3 forming a membrane on a second substrate of silicon wafer by the spinning process;
4 forming a heat driving part by forming electrodes and heat elements on a third substrate
5 of silicon wafer; and
6 adhering the nozzle part to the membrane, and the membrane to the heat driving part.

1 28. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 27, further comprising:
3 separating the membrane from the second substrate prior to adhering the nozzle part to
4 the membrane; and
5 separating the nozzle part from the first substrate prior to adhering the membrane to the
6 heat driving part.

1 29. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 27, further comprising:
3 adhering a first reinforcing element to the membrane subsequent to forming the
4 membrane on the second substrate;
5 adhering a second reinforcing element to the first substrate subsequent to forming the
6 nozzle part on the first substrate;
7 separating the first reinforcing element from the membrane subsequent to adhering the
8 nozzle part to the membrane and prior to adhering the membrane to the heat driving part; and
9 separating the nozzle part along with the second reinforcing element from the first
10 substrate prior to adhering the membrane to the heat driving part.

1 30. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 27, wherein:
3 the forming of the electrodes on the third substrate is performed by an lithography
4 process or a wet etching process; and
5 the forming of the heat elements on the third substrate is performed by the lithography
6 process, the spinning process or a lift-off process.

1 31. A process of manufacturing a plurality of fluid jetting apparatuses, comprising:
2 adhering a nozzle part to a membrane as a wafer type; and
3 adhering the membrane to a heat driving part, to form the fluid jetting apparatuses as a
4 wafer type.

1 32. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 31, wherein the adhering of the nozzle part to the membrane comprises:
3 forming the nozzle part on a first substrate of silicon wafer by a spinning process; and
4 adhering the nozzle part to the membrane subsequent to forming the nozzle part on the
5 first substrate.

1 33. The process of manufacturing a plurality of fluid jetting apparatuses as claimed
2 in claim 32, further comprising:
3 adhering the membrane to a second substrate by the spinning process prior to adhering
4 the nozzle part to the membrane; and
5 separating the membrane from the second substrate prior to adhering the nozzle part to
6 the membrane.

1 34. A fluid jetting device, comprising:
2 a plurality of fluid jetting apparatuses each to hold and jet jetting fluid and formed in a
3 shape of a wafer on a single substrate of silicon wafer.

1 35. The fluid jetting device as claimed in claim 34, wherein the plurality of fluid
2 jetting apparatuses comprise:
3 a plurality of driving fluid barriers formed on the single substrate, and having a
4 plurality of driving fluid chambers to hold driving fluid formed therein;
5 a membrane formed on the driving fluid barriers;
6 a nozzle plate formed on the membrane and having a plurality of nozzles formed
7 therein; and
8 a plurality of jetting fluid barriers, having a plurality of jetting fluid chambers to hold
9 and jet the jetting fluid, and formed on the nozzle plate.

1 36. A fluid jetting device having a plurality of fluid jetting apparatuses each to jet
2 jetting fluid, the fluid jetting apparatus comprising:
3 a substrate;
4 a plurality of electrodes and heat elements formed on the substrate;
5 a plurality of driving fluid barriers, having a plurality of driving fluid chambers to hold
6 driving fluid formed therein, and formed on the electrodes;
7 a membrane formed over the plurality of driving fluid barriers;
8 a nozzle plate formed on the membrane, and having a plurality of nozzles formed
9 therein and corresponding to the driving fluid chambers; and
10 a plurality of jetting fluid barriers, having a plurality of jetting fluid chambers to hold
11 and jet the jetting fluid, and formed on the nozzle plate.

